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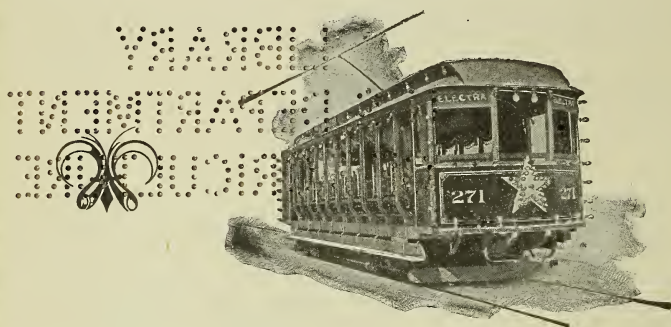
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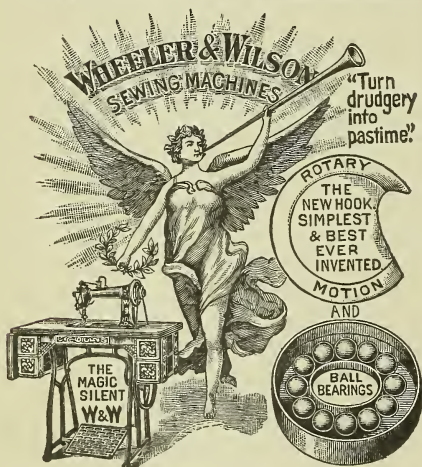
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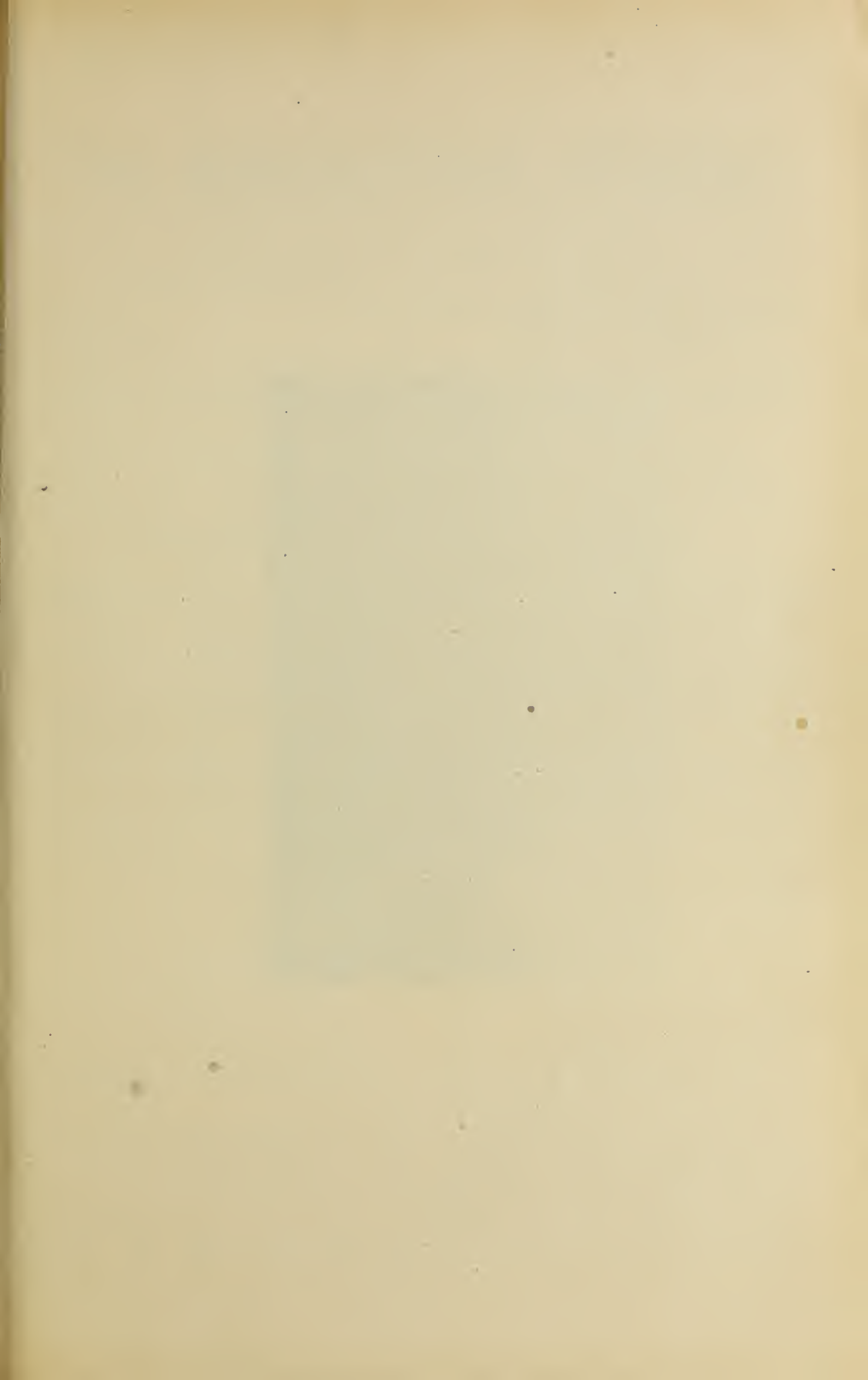
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A Springfield Township Boy and His Corn Field.

(See article by A. B. Graham, page 6.)

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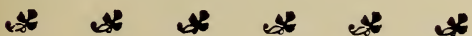
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EDITORIAL CHAT

With this issue, the AGRICULTURAL STUDENT begins a new regime. It has long been felt by many, that the paper, coming from the agricultural department, should be under the control of the students of the department, but not until recently, have the necessary steps been taken to make it such.

Last year, an Agricultural Society was formed in the Department, and upon this society will devolve the work of editing the AGRICULTURAL STUDENT. The plan is this: any person in the department may become a member of the society, by application and election. Then from the members of the society, the student staff, consisting of an editor-in-chief, and six associates, shall be chosen by vote of the members of the society. The staff will consist of seven members, the editor-in-chief and three associates from the Senior, and three associates from the Junior classes of the department.

Besides the student members of the staff, there will be a Business Manager and Advisory editor, chosen from the Faculty. In this manner, the paper will become a student publication, guarded by the faculty, and it is hoped



thus to make the magazine a stable organ in the interests of the department and its friends.

It is hoped that the students of the department, and that the members of the Agricultural Society, especially, will feel the responsibility thus placed upon them and cheerfully rally to the aid of the student staff. The editors feel that there is a great work that can be done by such a magazine, if all are willing to work and give them a helping hand. We hope that everyone will feel his own responsibility in this matter. If they do, the amount and ease with which the work can be accomplished, will be surprising.

The AGRICULTURAL STUDENT will, of course, look to members of the Agricultural College for contributions, but does not expect to confine itself entirely to members of the college. It seems that there is a prevailing idea that only members of the college contribute articles, but this is not the case. THE STUDENT is a paper for agricultural students, that is, students in any sense of the word, for advanced, as well as beginners, and students in any line of the work. A man whose work lies in this field, is a student, although he may not appreciate the fact. So if you have anything of interest to you and think it will be of interest to others, write it up and send it to us. We ask contributions from all persons interested in the work and hope that our asking is not in vain, for we are always glad to have ideas from persons who have been with us and gone out, or from those who may have never been with us, but who are doing the same work and are thus interested.

The current number of THE STUDENT introduces an innovation which we hope will meet with the approval of its readers. Beginning with this number,

a new department will be conducted, devoted to the advancement of the cause of agricultural education and nature study in the rural and secondary schools. THE STUDENT believes that the foundation for the study of agriculture should be laid in the lower schools instead of leaving all such instruction for the college. It is a significant fact that prominent educators in all parts of the country are awakening to the pedagogic value of the study of agriculture in the rural schools.

Ohio has been backward in introducing this work into the lower schools and this magazine feels that it perhaps has a mission in calling the attention of those most interested to the value of this line of work. This department will be continued throughout the year at least, and if it meets with the support and approval that we hope for, will become a permanent feature.

We have reason to think that we shall be able to present to our readers during the year, articles from the educators most prominently connected with this movement in this and other states. These articles will give, not only the reasons advanced by these men in favor of elementary agricultural education, but will abound in helpful hints as to the best methods of carrying on the work. We are especially fortunate in having the promise of a series of articles from Mr. A. B. Graham, superintendent of schools of Sprngfield township, who was the first teacher in Ohio to use the township agricultural club idea in the rural schools. He will tell of the results accomplished in his township. This department was decided upon at so late a date that in the present number it has not been possible to do more than introduce it to the reader. We invite communications from all who are interested in the work, either as teachers, pupils or parents.

The introduction of this new department will not in any way detract from those which have made the magazine popular in the past and it is hoped will generally be conceded to be a valuable addition.

THE STUDENT desires to make an important feature of the alumni news; for this reason all persons who know anything of interest concerning former students of the college of agriculture are invited to send in such notices as they can. Tell us all about yourselves and your acquaintances. Everybody who knew you when you were in college will be pleased to hear about you. Will the alumni help us to make the personal column especially attractive?

Agricultural Extension Work in the Rural Schools.

There has been a decided awakening in educational matters along industrial lines in the last generation. Schools and colleges have been organized to train students in the industries of life, to teach students to be producers of material things as well as to train the cultured mind. The trained hand and the trained mind have been taught to work together. In no line of industrial education has progress been more rapid than in Agriculture. Colleges established by the National Government and fostered by the State Governments have offered technical courses of study in Agriculture for the last quarter of a century, and the students trained in these Colleges have become leaders in all lines of Agriculture.

In Ohio it took many years for the work to become established and in 1892 there were but forty students enrolled in the Agricultural College, and in 1903-4 the number had risen to 256. The rapid development that has been

made in Agricultural Science and methods has emphasized the necessity of the successful farmer being trained in his profession and young men from the cities are turning to Agriculture because they believe it offers opportunities for successful careers.

Together with this development of the Agricultural College has come the idea of extension work in Agriculture to reach those who are unable to leave their homes and come to the Agricultural College. The State Farmers Institute has been organized and carried on by the State Board of Agriculture to take to the farmers in two days Institute or school's information in regard to Agriculture, and last year over 250 such Institutes were held in the State and over forty experts in Agriculture were employed to conduct the Institutes.

Another line of extension work in Agriculture and one which has only been carried on in the State for two years is the Agricultural extension work in our rural schools. It is a matter of fact that only a very small percentage of the boys who take up farming for their life work are able to take any training in the Agricultural College to prepare them for their life's work. They have no opportunity to gain any training except by apprenticeship on the farm, (I would not in any degree undervalue such training, for I regard it as one of the most essential parts of a student's education in Agriculture, but in itself it is not likely to give much inspiration) and they return to the farm after completing their grammar school or high school without having a single thing taught them in regard to the industry which is to be their life's work. They have probably been taught the habit of the rhinoceros or the giraffe and the kinds of wild ani-

imals that are to be found in Africa, but no mention has been made of the breeds of cattle and horses with which they will have to deal on the farm.

To awaken an interest in Agriculture and to turn the attention of the pupils of the rural schools to the necessity of studying Agriculture as well as to teach them some of its elementary principles, the extension work in Agriculture has been taken up in various states. In our own state the work has been begun in the formation of experimental clubs in the district and township schools in which the pupils carry on experiments under the direction of the Agricultural College. Pupils naturally love nature and become enthusiastic in planting and watching things grow and learning about the plants and animals with which they have always been associated. It dignifies Agriculture to them and when they are taught the real economic importance of farming, they respect and take a pride in the work of their fathers and are not anxious to get away from the farm. I believe there is an inherent love born in every child for the country and farm life. It shows in the efforts of business men of the cities in their latter years to secure farms and the pride and interest that they take in operating them.

The city boy who has never lived on a farm, longs for the opportunity to get into the country.

The spirit of education in Agriculture must extend to our public schools and be taken up by the teachers that they may help the thousands of boys who are taking up farming each year as their life's work. To do this the College of Agriculture stands ready to assist and to help in the development of the work, but the success of the extension idea rests with the individual teachers.

H. C. PRICE.

Rural School Agriculture

Boys have left the farm for many reasons: some because they were required by their parents to work on the "eight hour" plan—eight hours before dinner and eight hours after dinner; some because they were seeking, what, for live, active people does not exist—"snaps;" some because of overdrawn notions of the real pleasures of city life; some because the best conditions for education are thought to be found in the city; and some because they are taught at home from the lips of their own fathers and mothers that one who tills the soil need not be strong intellectually, that the life of a farmer is one of drudgery, not work, and that he must never seek to become in intelligence, in influence, in culture and refinement, and in society what his urban friend may become.

What young man or young woman cares whether the "eight hour" or "ten hour" plan is in vogue or not, when a result which should follow known causes is sought or awaited; or when a cause producing certain results is sought. "Snaps" are not desired. Drudgery is elevated to the plane of work by creating interest in knowing nature's laws and by the pleasure which comes from knowing them.

Primarily, agriculture should be taught in rural schools to acquire an elementary knowledge of the science and of the art. As a science, pupils of the advanced grades should be taught what soils are composed of, why they should be plowed, why certain methods of planting are best adapted to certain conditions, when and why cultivation is needed, why drainage is necessary, what is the best time to harvest, etc.; as an art, pupils should be required to work out on plats at home or at school (at home preferred), what he has

studied as a science. The experiments or testings may be too crude to produce the exact results which might be expected from an expert scientist, but the pupil's coarse work will usually verify the general scientific statements.

By such work traditional practices may be caused to be modified or a long known result may be immediately assigned its cause.

Much work of this kind can be done at home and at school without the formal study of physics or chemistry. It is really the best kind of preparatory work for both of these branches in the high school.

Secondarily, elementary agriculture should be taught to furnish greater opportunity to emphasize the fact that on the farm there are to be found conditions, which, if properly used, will make of boys and girls all that could be expected in good men and women.

For several years manual training schools have been organized and equipped in cities; this work has naturally turned toward the mechanic arts; it is equally natural that in the rural schools attention should turn toward the agricultural arts. Closely related to the study of the agricultural arts is the study of the environment of the rural home. To learn to know the animal and vegetable life for its beauty or its economic value is to learn to love them and to live in harmony with them in real experience or in literature.

In the coming months we hope to be able to tell something of how the boys and girls of Springfield township, Clark county have been started in learning a few things relating to the science and art of elementary agriculture, in making a better preparation for the intellectual, and social life, and in seeking and becoming acquainted with the real value of rural conditions.

A. B. GRAHAM.

An Opportunity

The Twentieth Century promises to be the century of great things for the youth and maiden reared on the farm. This is especially so from the educational point of view. It was not so very long ago that it was almost impossible for the farmer's child to get a good education, but, thanks to the wisdom of some of our more foresighted educators, that condition of affairs is rapidly disappearing. The passage of the Boxwell law has given the country boy a chance to enjoy with his city brother, the comfort and culture that comes from a good high school education, but from the standpoint of the rural youth there is still something lacking.

The truth is, that the school teaching of the past has all tended to educate the boy and girl away from the farm instead of fitting them for rural life. This has been true, not only of high schools and colleges, but even of the rural schools themselves. There is nothing in the curricula of the district, graded or high schools to fix the attention of the student on those things with which he comes in daily contact. One is led to believe that the courses of study were arranged with the requirements of the city youth alone in mind. There is nothing in the text books to interest the child in farm life. His time is devoted to abstract studies, which, important as they are, should yet be but a part of a complete education. It is quite as important a part of a good education to learn to observe the great and small things about us as to be able to speak correct English or to do a sum in arithmetic. The total ignoring in the text-books of all things pertaining to the farm and the failure of the teachers to call the student's attention to the wonders happening around him daily, have in the past had a tendency to di-

vert his mind from rural pursuits. It is not surprising when the boy meets no reference in his studies to the science of agriculture, that he should unconsciously come to the conclusion that there is nothing in farming worth studying and that if he is to be a student he must study law or medicine, engineering or theology. This feeling has unfortunately been intensified by the statement too often made by farmers themselves, that anyone can be a farmer—in other words, that no education is necessary for successful farming. And yet how untrue this is. The fact is that under the conditions of today, the farmer has need of the best of educations, the most thorough knowledge of book lore and the best trained powers of observation. There is daily occurring all about him the most wonderful of nature's processes and to appreciate and understand them and divert them to his own use, he must have a keen eye, a vivid imagination and a solid foundation in the arts and sciences.

Although the education of the past had a tendency to lead the young man away from the farm, I predict that in the future this condition of affairs will be changed and the farmer's sons and daughters will have an equal chance with those of the city to obtain an education that will fit them for their life work and that will attract them to the farm rather than away from it. Our opportunity is the golden one to assist in this change which is surely coming. Agricultural education is in the air and it is our place to decide if we shall help it along or stand in the way of progress. The demand for a course of study adapted to our changed conditions is already being felt and the wiser among our educators are looking around for ways to meet it. There is no doubt in

my mind that some of us will live to see a movement from the city to the farm as strong as the movement from farm to city has been in the past. At the present time about five thousand farms in Ohio are annually changing hands, many of them passing into the care of men with no previous agricultural training. The advent of the telephone, rural free delivery and the multitude of interurban electric lines have made rural life so much more attractive than it formerly was, that every year larger and larger numbers of people will leave the city for the life of the farm. Our civilization has changed mightily in a few centuries. The civilization of antiquity was built on the degradation of labor—ours is built on labor's exaltation. Now that labor with the hands is recognized as being just as dignified as labor with the brain, how doubly desirable must be the profession of agriculture which calls at once for the keenest mental activity combined with great manual dexterity.

The question is how to meet this demand for a better educational training for the young people of the rural districts. The Boxwell law was a step in the right direction. The consolidation of schools as practiced in some parts of the state is a decided advance and township high schools should be established wherever it is possible, for I heartily believe that our young people should live at home during those years of their lives, which are commonly spent in the secondary schools. But it is not enough that we establish high schools with courses such as are taught at present. The curriculum must be changed so as to introduce studies that are directly of rural importance. Personally, I think that every high school that has on its rolls any number of students from the country, should offer as

a part of the program, a course in scientific agriculture and domestic science.

Some of the states have made an attempt to solve this problem—notably, the state of Wisconsin. The state commissioner of education has felt for some years that agricultural instruction should be brought nearer to those who can make use of it. As a first step toward the achievement of this much-to-be-desired result, he persuaded the legislature of 1901 to enact a law, requiring all teachers in rural schools to pass an examination in elementary agriculture before being granted even a third grade certificate. This is but a preparatory step awaiting the time when an elementary course in agriculture and nature study will be required in every district school. This idea, contrary to the generally preconceived notions, has been readily received by the teachers themselves, for they see in it a chance to give their students some work in which they will be vitally interested. As few of these teachers have had a chance to learn anything of scientific agriculture, this subject has been given a prominent place in the teachers' institutes of the state. It was my pleasant duty to give courses in elementary agriculture at a few of the summer institutes and I was extremely gratified at the interest taken in it by the teachers. A large number of them have already introduced such work into their schools without waiting for the time when this course will be compulsory. This is but an example of the work that is being undertaken in a number of states and sooner or later such legislation will be demanded in Ohio. The more progressive teachers will not wait until then to take advantage of the opportunity to enlist the sympathies of the rural pupils in the study of elementary agriculture. This

magazine may reach some who have given no thought to this subject and their consideration of it is desired. The writer is positive that any teacher introducing this work into the school will be delighted with the interest exhibited by the pupils and the valuable results that are accomplished. THE STUDENT and the College of Agriculture stand ready to help the teacher in any way in their power and any questions forwarded to this magazine will receive prompt attention. ALFRED VIVIAN.



Professor Arthur Gillet McCall, whose picture we herewith present, was elected to the position of Assistant Professor of Agronomy, to fill the position left vacant by the resignation of Professor Merritt Finley Miller. Professor McCall is a native Buckeye, having been born at Buena Vista, Scioto county, Ohio. His early life was spent in the common schools and on the farm. After completing his own schooling, he became, for a time, a teacher in the schools of that vicinity, spending his summer in the Southern Ohio Normal School, at Manchester. He graduated from the Normal School in 1895. He

entered the long course in Agriculture at O. S. U., in 1896, graduating in June of 1900. Since graduation, Professor McCall has been connected with the Bureau of Soils, U. S. Department of Agriculture, where he has risen to be a very valuable man. Professor McCall has always been successful in his work, and his many friends express an earnest belief that his great success will continue with him in his new position.

Professor Miller.

Professor Merritt Finley Miller, is also an Ohioan, being born near Grove City. His early life was spent in the common schools, entering Ohio Wesleyan in 1895. He spent one year there, entering O. S. U. in 1896. He graduated in 1900, being a classmate of Prof. McCall. After graduation, he was for a time connected with the Bureau of Soils, U. S. Department of Agriculture, but left the department to take up the position of Assistant Professor of Agronomy in the O. S. U. Professor Miller resigned this position at O. S. U., to become Professor of Agronomy in University of Missouri. The fact that Professor Miller takes up his new position at a greatly increased salary shows that he is considered a valuable man. In leaving O. S. U., Professor Miller leaves a host of friends behind him who wish him the greatest success in his new field of operations.

The Honey Bee

BY LELAND E. CALL.

The traits of the honey bee which appear to the most of us as marvelous are due in a great part to the fact that bees live in communities. Each bee has its own work to do, and it does the work, paying no attention to its neighbor, and thinking (if it thinks at all) only of the accomplishment of its task and the preservation of the community.

At the opening of spring each colony of bees in good condition should contain a queen, thirty to forty thousand workers, and several hundred drones; also four or five combs fairly well stocked with a developing brood, with a good supply of honey. The queen, or mother, as she could be more appropriately called does nothing but lay eggs, and she does this at the rate of from thirty to forty a minute day in and day out, being able to lay four thousand eggs in twenty-four hours. This is her only duty, she is even fed by the workers, and the care of her as well as the care of the young is turned entirely into the hands of the nurse bees.

The queen mates but once; usually this takes place at the age of five to nine days old, climate and variety making some difference. Enough seminal fluid is stored in the spermatheca at this time to impregnate the great number of eggs that she will lay in the next two to three years. The queen seems to be able to control the fertilization of the eggs. Fertilized eggs develop into workers while unfertilized eggs develop into drones. Three years is the usual age to which the queen lives, though she may live to be four or five years old.

The queen usually begins laying eggs in January in the more central combs, and as the laying continues she works toward the outside of the hive. The eggs hatch on the third day after laying into white larvæ which the workers supply with nourishment in the form of bee-milk for the first three days, after this honey is added in case of worker larvæ while honey and pollen in the case of drone larvæ. As the weaning increases both workers and drones receive pollen and honey in increasing proportion in the place of bee-milk. If, however, the colony wishes to develop a queen they tare out the

walls of the cell and make it larger, and the young bee is fed on bee-milk for a number of days longer than in the case of the worker. This makes the queen much larger and stronger. While this is going on the young queen must be kept away from the old queen, for if the old queen should find the young one she would kill her. The time of development of the queen is fifteen and one-half days, workers twenty-one days and drones twenty-four days. After the larvæ has been fed for about five days the cell is capped by the adult bee with a porous covering, the larvæ strengthening this covering with a web-like secretion. After remaining in this form for about twelve days the perfect bee bites its way out of the cell. In a couple of days it takes up the work of nurse which it continues for about two weeks. But part of the later of its nurse days are spent in learning to fly and to locate the hive. After completing its duty as nurse the bee takes up the field work.

The workers, or developed females do all the labor of the community, gather honey, pollen, propolis, bring water, secrete wax, build combs, stop up crevices in the hive, nurse the young and defend the hive. Drones, aside from contributing warmth to the hive necessary to the development of the brood, have no office aside from reproduction. A large number of drones are supplied so that the young queen flying out to mate will not run too much risk from birds, insects and storms before finding her mate. Mating in the hive would result in continuous inbreeding. The act of copulation always kills the drone. At the time of the queen's mating there are in the hive neither eggs nor young larvæ from which to develop another queen, and if the queen should be lost it would soon result in the extinction of the colony.

The first work of the bees in the spring is to plaster the hive with propolis or bee-glue that is gathered from the buds and crevices of trees. This makes the hive nearly air-tight. Besides being used to plaster the interior of the hive it is also used to strengthen the comb at its attachments and sometimes to coat edges of completed cells. The method of collecting the propolis is with the mandibles. It is carried to the hive without being handled much, where the nurse bees chew it, mix it with saliva, and then it is ready for use.

Pollen and honey are the food of the bees and their brood. For the collection of pollen the bee makes use largely of its third walking leg. This is especially modified for the purpose; on the under side of the short tibia is the pollen basket, and the first tarsus is used in collecting the pollen. On the tibia opposite the pollen basket is the pollen comb which consists of nine rows of little bristles with long bristles around the outside. The pollen is removed from the comb of one leg into the pollen basket of the other leg, and is packed into the baskets with the middle pair of legs. A tibial spur on each middle leg is probably used in prying pollen out of the basket when the bee reaches the hive; if, however, the bee is unable to free the pollen itself it is assisted by the other bees. When the bee brings the pollen in it is placed as near the cells as possible, where it is taken care of by the nurse bees who place it in the cells; they fill only the lower part of the cell with pollen, placing honey on top. The pollen cells are usually above and beside the brood cells for convenience in feeding. In collecting pollen the antennæ of the bee becomes more or less covered with pollen, and for clearing the antennæ the first leg is used. This is accomplished by pulling the antennæ through the joint of the

first tarsus and tibia. It seems to be necessary that the antennæ be kept clean, possibly it aids the bee in keeping the direction of the hive.

Nectar or the liquid secretions of flowers is quite thin as it is collected by the bee; it contains a considerable quantity of water. The nectar is sucked up by the tongue of the bee, which is usually twenty-five to twenty-eight hundredths of an inch in length, into the honey sac which is located in the abdomen. This makes a convenient storage of the nectar for transportation to the hive. Possibly a part of the water is eliminated from the nectar by the worker before it reaches the hive, for between the fifth and sixth abdominal segments there is a small canal which is thought to be a gland used to separate a part of the water from the nectar. Besides containing water, the nectar has a raw, rank taste, and it is the purpose of the bee to make this into an esculent product. As the honey is disgorged from the worker bee into the cells it is mixed with saliva which contains considerable formic acid. This ripens and preserves the honey. The honey is then evaporated by the constant motion of the wings of the bees which keeps up a draft of air through the hive, and forces out the moisture laden air. In this way the water content of the honey is reduced ten to twelve per cent.; the disagreeable flavors due probably to volatile oils have also been driven off. The process of honey making is now complete and the cells are ready to be sealed with waxen caps.

These cells in which the honey is placed are made of wax secreted from the body of the nurse bee. The wax was formerly honey which has been changed within the body of the bee, and it is estimated that it takes eighteen pounds of honey to make one pound of wax. During wax secretion a high

temperature is maintained in the hive, and small scales of wax may be seen protruding from between the segments of the abdomen. These scales are passed forward to the mandibles by the wax pinchers on the legs, and the mandibles mould the wax into the shape of the cell. There are twenty-nine worker cells to the square inch, with combs seven-eighths of an inch thick. Drone cells are a little larger, there being eighteen to the square inch and one and one-fourth inches thick, while honeycombs are two to three inches in thickness. The queen cell resembles a peanut in shape, it is irregular and opens downward instead of being built horizontally as drones' and workers' cells.

This marvelous work of the bee is the result of division of labor in a colony. It must be due entirely to natural selection, as the worker bees have no offspring. This selection acts on the queen alone, for on her ability to produce eggs to form good workers depends the survival or extinction of the colony.

Lime As a Fertilizer.

A COMPARISON OF LIMES.

A so-called "hydrated" lime, made under process upon which patents are claimed, is being pushed upon the market under the claim that it is a fertilizer and that, because of its peculiar manufacture, it will produce better results than ordinary lime when applied to the soil. The price asked for this lime is usually about ten dollars per ton.

A sample of this lime was procured last fall direct from the manufacturers by the Ohio Experiment Station, and used at the rate of a ton to the acre on land that was being prepared for wheat. At the same time an ordinary builder's lime, ground into a meal and costing, delivered at Wooster in car lots, \$4.62

per ton, was used in the same quantity and on adjoining plots of land, the preparation of the land and the seeding being identical for both kinds of lime. In the spring the whole tract was sown to clover, and a good stand was obtained.

The result of this test has been that in every case the limed plots have produced less wheat than those not limed, there being but little difference in the reduction in yield following the two kinds of lime. Following are the average yields:

	Bushels per acre.
No fertilizer, no lime (av. 2 plots)	16.31
No fertilizer, hydrated lime (1 plot)	14.62
400 lbs. fertilizer, no lime (av. 3 plots)	27.43
400 lbs. fertilizer, hydrated lime (av. 2 plots)	26.73
400 lbs. fertilizer, common lime (av. 2 plots)	26.08

The clover now shows a fairly uniform stand on all the plots. Where no fertilizer was used the lime has had no apparent effect upon the clover, but where fertilizer was used the growth of clover is somewhat stronger on the limed than on the unlimed plots, there being no perceptible difference between the two kinds of lime in this respect.

In other tests made by this Station where the common lime has been used on corn, that being followed by oats and the oats by wheat, seeded to clover, the lime has produced a very slight effect on the cereal crops unless manure or fertilizer had been previously used; and even on clover the gain has been comparatively small until the land is first manured or fertilized; but where manure or fertilizers carrying both phosphorous and potassium have been liberally employed the effect of lime is to produce a most luxuriant growth of clover on land where, without lime, clover refuses to grow, no matter how liberal the manuring.

Our experience with lime to the present time may be condensed into the following statements:

1. Lime does not take the place of fertilizers or manure and the farmer who is led to so use it will be disappointed.

2. Lime is indispensable to the growth of clover on some Ohio soils; but before it can materially benefit the clover it must be preceded by liberal manuring, or fertilizing with materials carrying both phosphorus and potassium.

3. Lime may produce an increase of cereal crops on some soils, but only when used in connection with judicious manuring or fertilizing.

4. We have as yet no reason to believe that the so-called "fertilizer lime" now being pushed upon our market possesses any virtues not found in common lime.

Hessian Fly and Wheat Midge.

BY H. A. GOSSARD, ENTOMOLOGIST.

In answer to inquiries sent out by the Station, Hessian fly is reported for this season in 66 counties and wheat midge or "red weevil" in 59. The combined damage of these two insects to the crop is estimated to be not more than 10 to 15 per cent. for the state. At the Station the average percentage of stalks of all varieties infested with fly was 28.7 while the average percentage of fallen straw was 5.3. The midge was found present in 10 per cent. of the kernels of all varieties. The average yield from the Station plots as compared with the average for the past ten years was but little affected; but samples and estimates sent us from other localities indicate that in some instances the damage was severe, being as great or even greater than 50 per cent. in some fields.

The parasites of the fly were observed to issue in abundance during the early part of August, but enough "flax-seeds" remain unparasitized to furnish sufficient flies to cause serious damage next year if other conditions prove exceptionally favorable to fly development. Conditions in all respects, relating to fly, parasites and season, may be considered about normal thus far; hence, while no special alarm need be felt, it should not be forgotten that careless husbandry or the entrance of new factors into the situation may result in much loss. This possibility of exceptional damage renders advisable a brief statement of the most approved methods of guarding against the fly.

1. The preparation of the field, getting it into such a condition of tilth and fertility that the plants will get a good, strong start in the fall, even if sown late, is a most important item; and if the fly comes so late that the crop must be sown before its appearance and thus be obliged to breast the attack of the full brood, this point is yet more important.

2. Unless the fall brood of flies is very late in appearing, sowing should be deferred until after their disappearance. Perhaps no better plan can be devised to determine when the flies have appeared than for each farmer to sow a small "observation plot" of wheat during the last week in August in the northern border counties of the state, the first week in September in the central part and about the middle of September in the southern part. Each farmer should provide himself, as part of his equipment, with an ordinary magnifying glass such as may be obtained from his druggist or Harrison Cole, Columbus, Ohio. A good double lense with rubber case should be obtained for about 50 cents. The adult flies, small, dark, mosquito-like insects,

may be seen by the sharp observer in September or at latest in early October, alighting upon the upper sides of the leaf blades where the eggs (the "flax-seeds" are not eggs) are deposited in the blade creases or furrows. Sometimes the eggs are found on the inner surface of blades not over one inch high and too young to have turned upward. With the magnifying glass it is not difficult to find these minute, reddish, elongate-oval eggs and when they have once been found it will be but a few days until the brood of flies disappears. Wheat may be safely sown as soon as the eggs are found in any numbers as the flies will have disappeared before it has time to germinate and get up through the ground.

The flies should be looked for as early as the first week in September in the northern tier of counties, during the first three weeks of September in the northern half of the state, and during the last week in September and the first ten days of October in the southern half. Since the flies may come either earlier or later than these dates the utility of the "observation plot" suggested is apparent.

When the flies come so late as the last weeks in September in the northern part of the state and not until in October in the southern half, the farmer must decide for himself from previous experience on his particular farm, whether it is best to take the risk of injury from the fly or from weakness of plants due to late sowing. It is doubtless better in some instances to let the wheat stand the attack than to have it sown extremely late.

3. When the flies appear at about the usual time it is important for all the farmers of a neighborhood to co-operate in late sowing so that no early sown field will furnish flies for the entire neighborhood.

4. The larvæ of the wheat midges to appear next year are now buried in the earth not far from the surface. Plowing is therefore of service against them as well as against Hessian fly. Sowing in the stubble is bad practice from the standpoint of both insects. The screenings and chaff from the threshing machine should be destroyed as they contain thousands of midge larvæ.

5. If decoy strips of wheat are sown during the last of August or about the first of September, they will not only serve as "observation plots" but will also entice many of the flies to here deposit their eggs. As soon as the main crop is sown these decoy strips should be plowed under to destroy the eggs and young larvæ.

6. Varieties of wheat with thick, strong stalks resist the fly attacks better than small, weak-stalked kinds, and bearded wheats are seemingly more immune from midge attack than smooth sorts. These considerations are not the only ones to decide the question of choice of variety, but are worth noting.

Agricultural Department Notes

During the past summer, the work on the university farm has been pushed with a reasonable degree of success. The spring work was very heavy, owing to the fact that the clover, which was intended to be left for hay, died out and had to be plowed. This left nearly one hundred acres to be plowed for corn and about forty for oats. Notwithstanding the fact that the farm lacked in horses to do the necessary work, the crops were gotten out in fair season and have made an excellent growth. The corn has grown rapidly and the prospects are for a large yield both of fodder and grain.

No wheat was raised on the farm this season, but about forty acres will be

sown this fall. It is the intention to get a good variety of wheat established on the farm and raise good clean wheat to sell for seed wheat.

The only hay raised on the farm has been alfalfa. The first cutting was abundant and the stems were long and coarse. The second was very light, though of excellent quality and the third will be similar to the second. The field had been overflowed several times during the spring and the alfalfa plants were covered to the depth of about an inch with sediment, which, when dry, formed a hard crust and was broken up by using the disc harrow. Many of the plants seemed to have been drowned out, leaving patches in the field that were practically bare, except for the weeds which sprang up in immense numbers when the growing season came on, and have continued to harass the crop all summer. Some parts of the field seem to have been overcome by the weeds whose seeds were deposited in the silt last spring and have given up the race. The first cutting was ready for harvesting just about the time of the long continued rainfall in June and as curing it was impossible it was put through the ensilage cutter and stored in the silo.

A trial was made this summer of soybeans and cow-peas. The soybeans have made by far the largest growth. If they do not mature, which is hardly probable, they will be put through the ensilage cutter and into the silo.

A few acres of millet and of sorghum were also put out, but neither has made a particularly good growth.

The oats crop turned out about seventeen hundred bushels of oats of fine quality.

The dairy herd has consisted of about forty cows, including Jerseys, Holsteins, Shorthorns and various

grades, and the income from that source has been not far from six hundred dollars per month.

Expecting that new barns would soon be built, necessitating a general rearrangement of lots and buildings, the fences and buildings had been allowed to get into a disgraceful condition. The failure to get the necessary appropriation removed the possibility of our having the much needed buildings, consequently it was necessary to tear out the old fences and build new ones and to repair the old buildings and provide temporary shelter for the new machinery which had been purchased, and also for some of the cattle. There has been such a change made in the appearance of the place that students on coming back will scarcely know the old farm.

By the time this article goes to print a new superintendent will have taken charge of the farm. He is Mr. Chizholm, a young man from Canada and a student of the Guelph College of Agriculture.

J. C. WHITE.

Horticultural Department Notes.

There are perhaps some students who became interested in the work of the Horticultural Department before the end of the Spring term. At that time, owing to the lateness of the season, very little progress had been made and few crops were ready for market. It is the purpose of this article to give those interested an account of the work done during the summer months, to serve as a connecting link between the two terms of school.

It is very important in market gardening that the different crops follow one another very closely during the entire season. In this way, customers can be constantly supplied, and therefore will not have to draw on other

sources for their produce. In this respect the department has been very fortunate during the past season.

The principal marketable crops of summer are cabbage, potatoes, corn and tomatoes, following each other in the order named. They have followed and intermingled with each other so well, that it has been possible to keep customers constantly supplied. A liberal use of sodium nitrate on the cabbage so hastened its growth, that it was possible for it to be marketed ten days in advance of the cabbage of nearly all other gardeners, and showed returns, from something over one-half acre, of one hundred dollars, during the last week of June. At this time the asparagus crop had started on the decline. It had responded well to the liberal application of manure given it during the winter, and proved a very profitable crop. Early peas, however, were taking the place of asparagus on the market, and it was considered best to allow it to grow during the rest of the summer.

The second week in July brought the potatoes to maturity, and while the market was not all that could be desired, the yield was abundant, the potatoes were of good size, excellent quality and for early Ohio's, very free from knots. The marketing of this crop was of short duration, as the rapid decline in price made it advisable to dispose of them as quickly as possible.

About the middle of May a small bed in the greenhouse had been planted to Sparks Earliana tomatoes, and at this time they were found to be ripening. The plants had been taken from those intended for outside planting, and set out somewhat in the nature of an experiment. Their ripening at this time far in advance of outside tomatoes, seemed to show that profitable returns might be expected if plants were grown

much earlier for this particular purpose. As for the Earliana tomato for outside planting, one season's experience seems to show, that while they are a rapid grower and do well in the early part of the season, they are not able, on account of their tender skin and scanty leaf to withstand the hot summer suns. Of the other two varieties of tomatoes used, Livingston's Magnus and Stone, the latter variety has produced the finest specimens. The season has proven more favorable to their growth. In the preceding year the reverse was the case.

The island, on account of its light sandy soil, has been found to produce very early corn, and was given up entirely to sweet corn this year. Five varieties were planted at intervals of about ten days, and with the exception of one week, the yield has been steady. The cool weather has been responsible for a scanty supply from some sections and consequently high prices have prevailed during the latter part of the season. One variety which has been grown here this season, was pronounced by many to be the finest ever seen on the Columbus market.

While these various crops have, in their turn, required considerable time, the carrots have come in for their share of attention. Instead of planting the rows twenty-four inches apart as formerly, they are narrowed to eighteen inches this year. This width has allowed the use of a small one-horse cultivator, and until the space between the rows was almost filled with the tops. This crop required, with the thinning and weeding, almost constant care until the end of July, which for that time the tops had completely covered the ground and served as a check to any further growth of weeds. The crop is now waiting a convenient time in the late autumn to be marketed, and we

shall be greatly deceived if there is not a yield of from twelve to fifteen tons per acre.

That which has been said, and an inspection of the orchards and grounds will prove that the gardening season of 1904 has been a very gratifying one.

N. E. SHAW.

A Record of American Husbandry

The space devoted to an exhibit of the products and processes of agriculture at the St. Louis world's fair will far exceed that devoted to any one industry in any previous exposition. At the Columbian Exposition at Chicago it was the Manufacturers' Building that towered over all other structures. In it was grouped a vast display of the products of all lines of manufacturing enterprise, not only in this country but in foreign lands.

At St. Louis agriculture is given the premier place among exhibits. The Palace of Agriculture, which surpasses in extent all other exposition structures, is 1,600 feet long and will cost over half a million dollars. In all, inside and outside space, more than seventy acres are devoted to the progress and development of the science of husbandry.

Agriculture is not given this prominent place because of a sudden discovery that it outranks all other industries in point of value of product or importance to our national welfare. That it stands first among the industries of man and that all other activities rest upon the tilling of the soil was conceded long ago. It was given first place at this exposition because agriculture was so conspicuously the prime factor in the development of the territory embraced in the "Louisiana Territory."

The suggestion is made that the work of gathering and installing the colossal exhibits of agriculture and horticulture at St. Louis furnishes an opportunity for a comprehensive historical record of the development of American husbandry that should not be lost. The suggestion is worthy of serious consideration. Other expositions have devoted much space to agriculture, but the educational and historical material that was developed in the preparation of the exhibits was never utilized or preserved in such a way as to make it of practical value to American farmers or manufacturers.

In the annals of human progress there is nothing comparable to the story of the development of husbandry in this country. As the display at the St. Louis exposition is to be comprehensive and educational it will provide a wealth of material for the story of American agriculture, which should embrace not only the results of scientific husbandry but the activities that are directly related to the tilling of the soil.

A First-class Commission Firm.

We are pleased to call the attention of our readers to the advertisement of Clay, Robinson & Co., appearing in this issue. Said firm has always stood for the cause of agricultural education, as attested by the numerous purses, medals, etc., offered by them at the leading live stock shows of the past five years for proficiency in live stock judging, etc., to be competed for by students of agricultural colleges. No firm in the business is better or more favorably known, their reputation and reliability being beyond question.

Suggestions Concerning the Use of Fertilizers.

The principal considerations governing the economical use of manures and fertilizers, as indicated by the investigations of the Ohio Experiment Station, are (1) the character of the soil; (2) the kind of crop and (3) the system of management.

THE SOIL.

For the clay soils of eastern Ohio, especially those which lie upon and are largely derived from shales and sandstones, phosphorus is the element first required in a fertilizer, and until this is supplied neither nitrogen nor potassium can be used with economy. Phosphorus, however, will only produce its full effect when associated with abundant supplies of available nitrogen and potassium. When, therefore, the land has been depleted of its humus by exhaustive cropping the use of phosphorus alone will not produce maximum crops.

Our knowledge concerning the soil requirements of those parts of the State where the underlying rock is limestone is very indefinite, but there is some reason to suspect that on such soils potassium may occupy a relatively important position in the fertilizer than over the sandstones; but even here it will generally be found that phosphorus is essential to the full effectiveness of the fertilizer, and that a supply of available nitrogen must either be found in the soil, in the form of abundant humus, or else must be supplied in manure or nitrogenous fertilizers, before the maximum of crop production is reached.

The investigations of the Illinois Experiment Station have shown that on black, mucky soils, where the supply of humus is in excess, potassium may be the controlling factor in crop production; hence on such soils special attention should be given to supplying this

element, either in manure or in potash salts.

THE KIND OF CROP.

It does not appear that, within the range of ordinary farm cropping, the kind of crop plays as important a part in determining the composition of the fertilizer as many farmers have been led to believe. It is true that leguminous crops, such as clover, beans, etc., require less nitrogen than the cereals, potatoes, etc., and it appears that corn and potatoes are able to utilize organic nitrogen, such as that of manure or black soils, to better advantage than wheat or oats; but the fact that a particular crop may show a higher percentage of nitrogen or potassium in its composition than others may simply mean, as it does in the case of nitrogen in the leguminous crops, that it possesses a superior ability to obtain this element from natural sources. The attempt, therefore, to prescribe a special fertilizer for a special crop, without reference to the soil and the system of cropping, must be regarded as lacking a scientific basis.

On all soils the system of management plays a most important part in the scheme of fertilization. Where clover grows luxuriantly—and it will do so only on soils containing a fair supply of humus—a good crop of clover may secure a sufficient supply of nitrogen for its own use, with enough to spare for one or two crops of cereals or potatoes immediately following. Clover, however, cannot be depended upon to furnish more nitrogen than this, nor can it make up any deficiency of phosphorus or potassium. Hence, where clover does its best it may have the effect of so reducing the supplies of phosphorus and potassium that one or both of these must be furnished before maximum crops can be grown. For example, on a tract of land on the South

Farm of the Experiment Station at Wooster, on which potatoes, wheat and clover have been grown in a three-year rotation for ten years, the ten-year average yield of wheat has been:

27 bushels per acre without fertilizers;
33 1-3 bushels with phosphorus only;
33½ bushels with phosphorus and potassium, and

36 bushels with phosphorus, potassium and nitrogen.

In this case the increase from phosphorus has given a large profit, but the further gain from potassium and nitrogen has not been sufficient to justify their use, except in very small quantity.

On the other hand, on the East Farm of this Station, in a five-year rotation of corn, oats, wheat, clover and timothy, the land having been exhausted by many years of cropping with but little manuring, the ten-year average yield of wheat has been:

9 bushels per acre without fertilizers,
15½ bushels with phosphorus only,
17½ bushels with phosphorus and potassium, and

24 bushels with phosphorus, potassium and nitrogen.

In this case the complete fertilizer, carrying phosphorus, potassium and nitrogen has yielded a larger net profit than any partial fertilizer.

In general, it may be assumed that land which is sufficiently fertile to produce 50 bushels of corn or 25 bushels of wheat per acre may be held close to the maximum production by the growth of clover every third season, with the addition of a small quantity of phosphorus or potassium, one or both; but when the average yield falls much below these quantities, under a three-year rotation with clover, then the addition of nitrogen to the fertilizer is indicated.

For soils which have been depleted by exhaustive cropping the following

system of management is suggested:

(1) Apply stable manure to land intended for corn, using it at the rate of 8 to 10 tons per acre. If possible, let the manure be taken directly from the stable to the field, and if it has been dusted during accumulation with acid phosphate or raw phosphate rock (floats) its effectiveness will be greatly increased for most soils.

(2) A crop of wheat or oats may follow corn treated as above, without further manuring or fertilizing, and if clover, be seeded with this crop, the clover sod to be manured and planted to corn (or potatoes) thus establishing a rotation in which clover is grown every third season in alternation with a manured and cultivated crop, the best conditions for fertility recovery will have been provided and a gradual increase in productiveness may be expected.

(3) If a second crop of small grain be grown (as wheat after oats) it will be necessary to manure again or else use a complete fertilizer if the maximum yield is obtained. The proportion of ammonia, however, need not exceed two or three per cent. Clover should be sown with this crop.

(4) If, for any reason, a third crop of grain be grown before clover comes into the rotation it should receive a fertilizer containing 4 to 6 per cent. ammonia, applied at the rate of 300 to 400 pounds per acre. Such cropping is likely to prove less profitable than where clover is more frequently grown.

(5) When clover fails to prosper on land that has been liberally manured or fertilized, making a fair stand, perhaps, but showing a weak growth after the wheat has been taken off and finally dying out altogether in spots, the use of lime is indicated. Present indications are that lime will produce more clover when applied to a crop preceding the

wheat by one or two seasons than when applied to the crop with which the clover is sown. No definite quantity of lime can be stated for all conditions, but it is safe to use a ton to the acre.

(6) If a farmer's present system of management does not provide sufficient stable manure to carry out this plan, then it is time to readjust that system; for the Ohio farmer who undertakes to bring up an exhausted soil to a profitable state of productiveness through the use of commercial fertilizers alone will generally find that the margin between cost of production and value of crop will leave him a very meager compensation for his labor.

General Agricultural News.

Dr. Wilcox, of Chicago University, has been appointed assistant professor of soils at the Iowa Agricultural College. He has specialized in geology and chemistry and has spent a number of years studying the soil of one of the southern states.

Professor John A. Craig of the Texas Experiment Station has been chosen by the World's Fair management at St. Louis to tie the ribbons on Galloway cattle at their exhibition there this month.

Dr. Edmund James, who, for the past two years has been at the head of Northwestern University at Evanston, Ill., has accepted the presidency of the Illinois State University at Champaign, and will assume his new duties November 1. Dr. James is a native of Illinois, having been born at Jacksonville, in 1855.

Prof. L. S. Klinck, a graduate of Guelph, Ont., and last year a post graduate at Ames, has been selected assistant professor of farm crops and placed in charge of that department at the Iowa Agricultural College. J. W. Jones of Illinois has been chosen field

superintendent and assistant in farm crops at the same school.

A school for education in breeding, feeding and judging live stock, also in raising all sorts of field crops, under the auspices of the American Association of Agricultural Colleges, will be held in Live Stock Congress Hall on the St. Louis World's Fair Grounds, September 12 to October 10. Prof. J. H. Shepard of the South Dakota Agricultural College will be superintendent of the school.

The Pennsylvania Agricultural Experiment Station at State College has just issued a second bulletin No. 68, detailing the results of experiments conducted there last winter with feeding steers. This experiment was begun to test the relative economy of feeding steers outside in open sheds or feeding in warm barns. The general result of the test was similar to that of the preceding one along the same lines, namely that the steers in the barn ate a little less feed for a pound of gain than those in open sheds.

Rhode Island Agricultural College reports an unusual number of applicants this year. They are offering a new course in highway engineering that is attracting much attention.

Mr. C. F. Austin of the Maryland Agricultural College, has been appointed agriculturist at the central Cuban station.

At a recent meeting of the State Board of Agriculture an appropriation was voted for a geological survey of the mineral resources of Virginia. The survey will be conducted jointly by the State Board of Agriculture and the Virginia Polytechnic Institute. Dr. Thomas L. Watson, Professor of Geology in the Polytechnic Institute was appointed geologist-in-charge of the survey.

The Twelfth National Irrigation Congress will be held at El Paso, Texas, from November 15 to 18. The Congress will meet in four sections, the names of which indicate that attention will be paid to popular interests. They are: "Save the Forests," "Store the Floods," "Reclaim the Deserts" and "Homes on the Land."

There are two hundred and seventy periodicals published by students in American Universities and colleges. Of this number 150 are monthlies, 65 are weeklies, 15 are dailies, 12 are quarterlies, 10 are bi-weeklies, 5 are semi-weeklies, 9 are semi-monthlies and 2 are bi-monthlies.

In spite of the fact that the St. Louis Exposition drew many people from the Ohio State Fair, it was a substantial success. The attendance did not equal that of last year, which was indeed the best year and might be said to be a record breaker. The different departments, both art and animal industry, were up to the standard of other years. To students of animal husbandry the cattle exhibit was noticed to be just a little better than a preceding year. The horse barns were filled with the finest grade of imported French Percheron and Coach. The Hartman stock farm, which for the last few years has been coming to the front with importations, had things considerably their own way. McLaughlin Bros. at the same time were winning prizes at St. Louis that if continued would make them America's leading importers. These establishments are both located in the city of Columbus and students of the Ohio State University should consider themselves fortunate in having such easy access to them.

Eyes of Agricultural men are now turned to the President of the United States as he selects a new Assistant Secretary of Agriculture. The depart-

ment was soon to realize its loss in the death of Colonel Brigham, but it is hoped that a man with as strong principles in the defense of agriculture as Mr. Brigham will succeed him.

At this writing the end of the "butchers' strike" is not in sight. Agricultural philanthropists are bringing all power to bear on this great question. Cattle, hogs and all animals of meat value have depreciated so much as to make cattle and hog raising a serious problem to the farmer. Many are buying on the strength of low prices; others, who formerly fed extensively, have cut down their droves to almost nothing.

An Emergency Appropriation.

The readers of the STUDENT are familiar with the history of the appropriation of \$75,000 for the College of Agriculture, which was vetoed by the Governor. Part of that money was to have been expended in needed repairs in the dairy department.

The Emergency Board, consisting of Governor Herrick, Auditor of State, Guilbert, Attorney General, represented by Assistant Jones, Senator Harris, chairman of the Finance Committee of the Senate, Mr. Crafts, chairman of the Finance Committee of the House of Representatives, was appealed to for aid.

They visited the dairy laboratories and after careful investigation, decided that an emergency existed and granted leave for the Board of Trustees to create an emergency of \$9,000. This does not mean that such an amount is appropriated from the State Treasury, but that the money may be borrowed at a rate of interest not exceeding four per cent. It is hard to borrow money at that rate, but Governor Herrick has given assurance that the money can be

secured. The next legislature will be asked by the Emergency Committee to provide for the emergency, which is usually done very promptly.

The State officers were much interested in what they saw during their visit and expressed the opinion that the College of Agriculture should be well equipped.

Steps have been taken to make the needed changes with as little delay as possible. Eighty expanded steel lockers have been ordered. They will be placed in the locker room and will provide a place for the white suits worn by the dairy students and the glassware provided for them.

A steel steam pressure sterilizing oven has been ordered from the Star Milk Cooler Company, of Haddonfield, N. J., to be placed in the milk bottling laboratory.

The firm of Peters, Burns & Pretzinger, architects, of Dayton, Ohio, have been directed to draw plans for necessary changes in the laboratories and the dairy power house. These changes will be described in a later issue of the STUDENT.

Dairy Notes.

E. D. Holl, a four year student in Agriculture, at O. S. U., is specializing in dairying. Just at present he is operating a creamery at New Washington, Ohio. A recent letter from the firm in Philadelphia, praises the quality of his butter, saying that it runs first class, while many creameries have been running poor. Mr. Holl expects to resume his work at O. S. U., later in the year.

Mr. F. P. Mills, of Marysville, Ohio, and Mr. W. G. VanMeter of Philadelphia, have returned to the University, to spend the year in special dairy work, and the studies closely related thereto. Mr. Mills has been engaged in creamery work the past summer, and Mr. Van Meter was night foreman in the new sanitary milk plant belonging to McJunkin Straight Dairy Company, in Pittsburg. Part of his work was to standardize the amount of butter fat in 3,000 gallons of milk each night.

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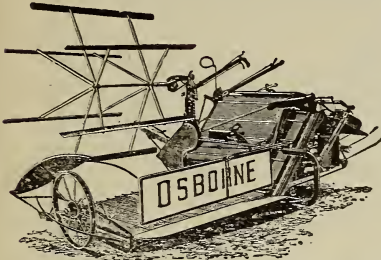
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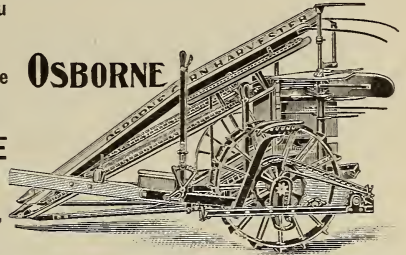


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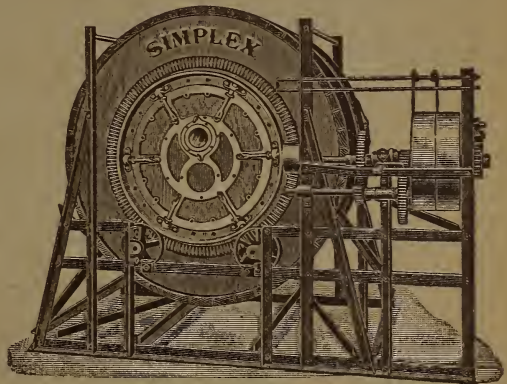
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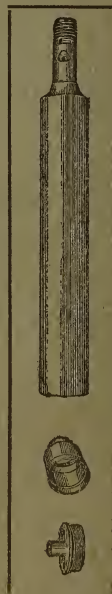
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